

## ENVIRONMENTAL PROTECTION AGENCY

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### Principal Areas of Focus

The core purpose of the Global Change Research Program in the U.S. Environmental Protection Agency (EPA) Office of Research and Development is to provide scientific information to stakeholders and policymakers to support them as they decide whether and how to respond to the risks and opportunities presented by global change. The program is stakeholder-oriented, with primary emphasis on assessing the potential consequences of global change (particularly climate variability and change) on air quality, water quality, aquatic ecosystems, and human health in the United States. The program's focus on these four areas is driven by EPA's mission and statutory and programmatic requirements. EPA uses the results of these studies to investigate adaptation options to improve society's ability to effectively respond to the risks and opportunities presented by global change, and to develop decision-support tools for resource managers coping with a changing climate. EPA also has begun to invest in decision-support tools to help decisionmakers evaluate alternative strategies for reducing greenhouse gas emissions and the environmental implications of those strategies.

The program uses a place-based approach because the impacts of global change and their solutions are often unique to a location (e.g., a watershed). Partnerships are established with locally based decisionmakers to ensure that the program is responsive to their unique scientific information needs and the socioeconomic realities at their locales.

EPA's work is consistent with and closely coordinated with the *Strategic Plan for the Climate Change Science Program*. Planning and implementation of EPA's program is integrated with other participating Federal departments and agencies to reduce overlaps, identify and fill programmatic gaps, and add value to products and deliverables produced under the CCSP's auspices. EPA coordinates with other CCSP agencies to develop and provide timely, useful, and scientifically sound information to decisionmakers. EPA is committed to support of CCSP's research and assessment activities. This commitment includes assessments uniquely focused on EPA's mission and statutory requirements (e.g., assessments of the impacts of global change on air and water quality) and support for statutory mandates on the CCSP to produce periodic assessments of the potential impacts of climate change for Congress. Also, as called for by the National Research Council in 2001, EPA supports and fosters projects that link the producers and users of knowledge in a dialog that builds a mutual understanding of what is needed, what can credibly be said, and how it can be said in a way that maintains scientific credibility.

EPA's program has two major areas of emphasis: air quality and water quality/aquatic ecosystems. The program also evaluates the human health consequences of the changes in air quality, water quality, and aquatic ecosystems.

#### *Air Quality*

Studies are underway that examine the potential consequences of global change on air quality in the United States. The long-term goal of this focus area is to provide the approaches, methods, and models to quantitatively evaluate the effects of global change on air quality, and to identify technology advancements and adaptive responses and quantify their effect on air quality.



## Appendix A

### *Water Quality/Aquatic Ecosystems*

EPA's mission is to protect human health and safeguard the natural environment. EPA provides environmental protection that contributes to making communities and ecosystems diverse, sustainable, and economically productive. Consistent with this goal, EPA's Global Change Research Program is assessing the impacts of global change on water quality and aquatic ecosystems in the United States.

Water quality is affected by changes in runoff following changes in precipitation and evapotranspiration and/or changes in land use. The program is investigating the possible impacts of global change (climate and land-use change) on water quality using a watershed approach. A major focus is on studying the sensitivity to climate change of goals articulated in the Clean Water Act and the Safe Drinking Water Act, and the opportunities available within the provisions of these Acts to address anticipated impacts.

The program also has planned research activities that evaluate the effects of global change on aquatic ecosystems (which may include lakes, rivers, and streams; wetlands; and estuaries and coastal ecosystems), invasive non-indigenous species, and ecosystem services. EPA's investigations of the effects of global change on aquatic ecosystems uses as input the research being done by other CCSP agencies on marine and terrestrial ecosystems. Therefore, EPA's ability to successfully complete its assessments depends crucially upon the ability of other CCSP agencies to complete their related research activities.

### *Human Health*

Since health is affected by a variety of social, economic, political, environmental, and technological factors, investigating the health impacts of global change is a complex challenge. As a result, health studies in EPA's Global Change Research Program go beyond basic epidemiological research to develop integrated health evaluation frameworks that consider the effects of multiple stresses, their interactions, and human adaptive responses. Along with health sector studies conducted in conjunction with other CCSP agencies, there are research activities focused on the possible consequences of global change on weather-related morbidity and vector- and water-borne diseases. In addition, the results from the program's air quality studies and water quality studies will be used to evaluate health consequences.

Intramural and extramural research contribute to all of EPA's investigations. In an attempt to capitalize on expertise in the academic community, a significant portion of the program's resources is dedicated to extramural research grants administered through the STAR (Science to Achieve Results) program. The STAR program focuses on science to support investigations of the consequences of global change for air quality, ecosystems, and human health in the United States. EPA will continue to coordinate closely with other CCSP agencies to identify the specific topics that should be emphasized within the STAR program.

### *Program Evaluation*

The EPA Global Change Research Program is evaluated through extensive review by EPA's independent Board of Scientific Counselors (BOSC). A review in 2006 by the BOSC concluded that the program has conducted the "right work" and done it "well." The program "has provided substantial benefits to the Nation" and "is on course to make significant further contributions to societal outcomes by informing and facilitating decisions by the public and private sector actors who must consider the prospects of global change."

## Program Highlights for FY 2009

EPA will continue to make significant contributions to the ongoing research activities of CCSP, and provide timely and useful information to resource managers coping with a changing climate. EPA-sponsored investigations will continue to be conducted through public-private partnerships that actively engage researchers from the academic community, decisionmakers, resource managers, and other affected stakeholders. Highlights of specific activities to be completed by or initiated in FY 2009 follow:

- Complete the three CCSP synthesis and assessment products for which EPA is the Lead Agency
- Initiate the second phase of EPA's quantitative assessment of the effects of global change on air quality in the United States
- Release final report on the potential impacts of climate change on combined sewer overflow mitigation in the Great Lakes and New England Regions
- Initiate an assessment of the impacts of climate change on water quality in the United States in support of EPA's statutory requirements under the Clean Water Act and the Safe Drinking Water Act
- Release an assessment of the effects of climate change and interacting stressors on the establishment and expansion of aquatic invasive species, and the implications for resource management
- Complete an assessment of the consequences of global change for water quality related to biocriteria
- Release a new online Climate Assessment Tool that provides resource managers with the ability to assess and manage impacts of climate change on sediment loadings to streams (e.g., through the use of riparian buffer zones)
- Co-sponsor with NOAA a study by the National Research Council of strategies and methods for climate-related decision support
- Issue a joint Request for Proposals with the Centers for Disease Control and Prevention focusing on the potential impacts of climate change on human health in the United States.

## Related Research

In addition to focused CCSP activities, EPA conducts research that contributes to the characterization and understanding of risks to ecosystems and to human health. The ecosystems-based research is designed to understand and predict ecosystem exposure, responses, and vulnerabilities to high-risk chemicals and non-chemical stressors (e.g., invasive species, genetically altered organisms) at multiple scales of biological organization and geographic scales. The research in human health is oriented toward assessing the cumulative health risks to humans (e.g., cancer, reproductive, cardiovascular)—including high-risk subpopulations (e.g., children)—from chemical stressors emanating from multiple sources. Both of these major research areas will be affected by and are inextricably interrelated with climate change.